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BERKELEY 4, CALIFORNIA

December 14, 1956

Professor Joshua Lederberg
Department of Genetics
College of Agriculture
University of Wisconsin
Madison 6, Wisconsin

Dear Professor Lederberg:

Many thanks for your letter of November 27 and the reprint which I found most interesting. I had somehow missed this collection. I got the first one on "Physiology and Chemistry of Growth" but I hadn't seen this second volume and will now get hold of the entire book, which I presume exists.

Your remarks on the necessity for bringing together these chemical autocatalytic systems in some organized way before the SR unit will come into being adds another aspect to the generation of the autocatalytic systems themselves. I am not at all certain that there is anything different in kind between the evolution of an autocatalytic chemical system and the organization, or confluence, of two such evolutionary sequences into a single unit. I should think that the same principles of efficiency in chemical transformation, or what is equivalent in biological terms, "survival value," would select amongst random combination of these systems in exactly the same way.

As for the discovery of chemical model systems to illustrate this, I can't draw one forth for the asking as yet, but now that you have pinpointed what appears to you a particular difficulty in the development of SR systems, perhaps one will come before me in the not too distant future.

I have been visualizing the development of photosynthesis in just this way: That is, the independent and quite separate evolution of the enzymatic systems for the reduction of CO_2 using whatever reducing sources are available on the one hand, and the also independent evolution of the porphyrin systems for the manipulation and transfer of oxygen atoms on the other. The porphyrins here evolved not for their light-absorbing quality but for their particular electronic structures. It happens that such electronic structures must also absorb light in the visible region and the random development of the ability to transfer this energy absorbed from the visible region to chemical species led to the coupling of these two independent streams.

Now I am well aware that this is on a much higher level of organization than that which you are seeking, but I suspect that we will be able to find relatively simple model systems illustrating the same points.

Very truly yours,

Melvin Calvin

Melvin Calvin
Professor of Chemistry

MC:nw
Encl.